

# MANUFACTURING OF PAVER BLOCK USING PLASTIC WASTE

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**Abstract**— In this project in mainly focus on replacing cement with plastic waste in paver block and reducing the cost of paver block when compared to that of conventional concrete paver blocks. At present nearly 56 lakhs tones of plastic waste are produced in India per year. The degradation rate of plastic waste is also a very slow process. Hence this project will helpful in reducing plastic waste. In India above 40% of fly ash is still unused. So, the fly ash infused in this plastic paver block. In this project we have used plastic waste in different proportions with M Sand, coarse aggregate and fly ash. The paver blocks were prepared and allowed to have compression test, oven test, absorption test and flexural tested and the results were of compared and discussed.

**Index Terms**— Paver block, Plastic waste, Coarse aggregate, Fly ash, Compressive Test, Oven test.

## I. INTRODUCTION

Plastic waste used in this work was brought from the surrounding areas. Currently about 56 lakh tonnes of plastic waste dumped in India in a year. The dumped waste pollutes the surrounding environment. As the result it affects both human beings and animals in direct and indirect ways. Hence it is necessary to dispose the plastic waste properly as per the regulations provided by our government. The replacement of plastic waste for cement provides potential environmental as well as economic benefits.

With the view to investigate the behaviour of quarry rock dust, recycled plastic, production of plastic paver block from the solid waste a critical review of literature was taken up. An attempt was made by Nivetha C et.al<sup>1</sup> to reuse the solid waste quarry dust fly-ash and PET with an aim not to lose the strength far from original Paver blocks. From the observations of test results, PET can be reused with 50% of quarry dust and 25 % of fly-ash in Plastic Paver block. The physical and mechanical properties of materials used in Plastic Paver block were investigated. For the test 6 cubes cube were cast for measuring Compressive strength. Satish Parihar et.al<sup>2</sup> used recycled plastic aggregate in various proportions in concrete mix and check there stability. Amount of waste plastic being accumulated in 21st centuries has created big challenges for their disposal, thus obliging the authorities to invest in felicitating the use of waste plastic coarse aggregate in a concrete is fundamental to the booming construction industry. Three replacement levels of 10 %, 20 %, 30 by weight of aggregates were used for the preparation of the concrete. Poonam Sharma<sup>3</sup> et. al. discussed about cement concrete paver blocks for rural roads. The study of Joel Santhosh and Ravikant Talluri<sup>4</sup> indicated that fly ash and waste glass powder can effectively be used as cement replacement without substantial change in strength.

## II. EXPERIMENTAL PROCEDURE

### 2.1 Properties of Materials

#### Plastic waste (PET)

Plastic waste used in making paver block was collected from the surrounding locality PET is indicated by resin number 1.Using Water Bottle.PET Melting point is 250 degree.

S.no	Particular	Value
01	Melting point	150°
02	Thermal co efficient of expansion	100-200X10-6
03	Density	0.910-0.940
04	Tensile strength	0.20-0.40(N/mm2 )

#### Fly ash

Fly ash is the finely divided residue that results from the combustion of pulverized coal and is transported from the combustion chamber by exhaust gases. Density 1380kg/m<sup>3</sup>

Chemicals	Forumula	Content(%)
Silicon Dioxide	SiO <sub>2</sub>	59.04
Aluminum Oxide	Al <sub>2</sub> O <sub>3</sub>	34.08
Iron Oxide	Fe <sub>2</sub> O <sub>3</sub>	2.0
Lime	Cao	0.22
Sulphur Trioxide	SO <sub>3</sub>	0.05

Magnesium Oxide	MgO	0.43
Alkalies	Na <sub>2</sub> O	0.5
Alkalies	K <sub>2</sub> O	0.76
Loss of ignition	LOI	0.63

### Coarse Aggregate

Locally available coarse aggregates were used in this work. Aggregates passing through 12mm sieve and retained on 10mm sieve were sieved and tested as per Indian standard specification IS:383-1970.

### M SAND

The full form of M sand is **Manufactured Sand**. This is an artificial type of sand formed by crushing large hard stones, mainly rocks or granite. It is used as a substitute of river sand mainly for creating concrete or mortar mix. Density 1850kg/m<sup>3</sup>.

### 2.2 Mix Ratio

M25 grade 1:1:2 ratio

Mould size 240mm X 120mm X 60 mm

Volume of mould=0.0001728m<sup>3</sup>

- Fly ash - 0.596kg
- M Sand – 0.7922kg
- Coarse aggregate – 2.5kg

Plastic waste using binding materials

### 2.3 Preparation of Test Specimens

Plastic wastes are heated in a metal bucket at a temp of above 150°. As a result of heating the plastic waste melt. The materials quarry dust, aggregate and other materials as described in previous chapter are added to it in right proportion at molten state of plastic and well mixed. The metal mould is cleaned through at using waste cloth. Now this mixture is transferred to the mould. It will be in hot condition and compact it well to reduce internal pores present in it. Then the blocks are allowed to dry for 24 hours so that they harden. After drying the paver block is removed from the moulds and ready for the use.



### 2.4 Testing of Specimens

#### 2.4.1 Compression test

Compressive strength for paver blocks Plastic paver blocks of size 215X115X6mm were casted. The maximum load at failure reading was taken and the average compressive strength is calculated using the following equation. Compressive strength (N/mm<sup>2</sup>) = (Ultimate load in N / Area of cross section (mm<sup>2</sup>))



**2.4.2 Water absorption test**

For concrete pavers the test procedure involves drying a specimen to a constant weight, weighing it, immersing it in water for specified amount of time, and weighing it again. The increase in weight as a percentage of the original weight is expressed as its absorption



**2.4.3 Oven test**

As the paver block is made of plastic we need to know its melting point hence oven test is performed. The paver block is kept in oven for 2 hours in oven and after 2 hours its condition is verified.

**III. RESULT AND DISCUSSION**

**Water absorption test**

Sample No	Weight of dried specimen (W1)	Weight of saturated specimen (W2)	Weight of water absorption $W3=(W2-W1)$	% of water absorption $(W3/W1) \times 100$
01	2923	2923	0	0.0

**Compression test**

Proportion name	Plastic waste	Coarse aggregate	Fly Ash	M-Sand	Compressive stress (N/mm <sup>2</sup> )
01	1kg	2.5kg	0.596kg	0.7922kg	16.6
02	1kg	2.5kg	-----	1.2kg	13
03	1kg	2.5kg	1kg	-----	12.3

**Oven Test Result**

Since the paver block is made of plastic it is required to know its heat resistance. Hence plastic paver block is placed in oven for 2 hours.

Specimens	Temperature (°C)	Remarks
SPECIMEN I	50	no change
	100	no change
	150	Melts
SPECIMEN II	50	no change
	100	no change
	150	Melts
SPECIMEN III	50	no change
	100	no change
	150	Melts

#### IV CONCLUSION

The following conclusions were drawn from the experimental investigation

- The utilization of waste plastic in production of paver block has productive way of disposal of plastic waste.
- The cost of paver block is reduced when compared to that of concrete paver block.
- Paver block made using plastic waste, quarry dust, coarse aggregate and ceramic waste have shown better result.
- It also shows good heat resistance.
- Though the compressive strength is low when compared to the concrete paver block it can be used in gardens, pedestrian path and cycle way etc.
- It can be used in Non-traffic and light traffic road.

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